# GPM Ground Validation Met One Rain Gauge Pairs MC3E

## Introduction

Sixteen tipping bucket rain gauge pairs were deployed alongside each Autonomous Parsivel Unit (APU) during the Mid-latitude Continental Convective Cloud Experiment (MC3E) in northern Oklahoma. Along with the disdrometers, these rain gauges provided an additional means for directly measuring rainfall during the MC3E campaign. Two different models of these rain gauges (Model 370 and Model 380), which are manufactured by MetOne Instruments, Inc., were used during MC3E. The data for each rain gauge was collected at 1-minute intervals. Data was collected from 22 April 2011 through 06 June 2011.

## Campaign

The Midlatitude Continental Convective Clouds Experiment (MC3E) took place in central Oklahoma during the April-June 2011 period. The experiment was a collaborative effort between the U.S. Department of Energy (DOE) Atmospheric Radiation Measurement (ARM) Climate Research Facility and the National Aeronautics and Space Administration's (NASA) Global Precipitation Measurement (GPM) mission Ground Validation (GV) program. The field campaign leveraged the unprecedented observing infrastructure currently available in the central United States, combined with an extensive sounding array, remote sensing and in situ aircraft observations, NASA GPM ground validation remote sensors, and new ARM instrumentation purchased with American Recovery and Reinvestment Act funding. The overarching goal was to provide the most complete characterization of convective cloud systems, precipitation, and the environment that has ever been obtained, providing constraints for model cumulus parameterizations and space-based rainfall retrieval algorithms over land that had never before been available.

Further details on GPM MC3E are available at https://ghrc.nsstc.nasa.gov/home/field-campaigns/mc3e. Information on MC3E ARM is available at https://www.arm.gov/research/campaigns/sgp2011midlatcloud.

## Instrument Description

The Model 370 gauges have a 20.3 cm diameter catchment funnel and a resolution of 0.01 inches of liquid water for each tip. The Model 380 gauges have a 30.5 cm diameter catchment funnel and a resolution of 0.2 mm of liquid water for each tip. The 0.2 mm resolution rain gauges were sited alongside APU01,02,10-16, whereas the 0.01 inches resolution rain gauges were sited alongside APU03-08. These gauges measure rainfall over an interval of 1 minute.

## Investigators

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## File Naming Convention

Non-QC data are in tared files of the form:

tbgauge_apu##_mc3e_<latitude_longitude>.tar

where

apu = Autonomous Parsivel Unit
## = station identifier
mc3e = Midlatitude Continental Convective Clouds Experiment
latitude_longitude = geographic location of the instrument
tar = Unix "tape archive" format

The following ASCII files are contained within the Non-QC tar archive:

tbgauge_apu##-01_mc3e_<latitude_longitude>_yyyymmdd_minuteRain.txt
tbgauge_apu##-01_mc3e_<latitude_longitude>_yyyymmdd_rainRate_gmin.txt
tbgauge_apu##_mc3e_<latitude_longitude>_yyyymmdd_hrlyRain_qc.txt
tbgauge_apu##-02_mc3e_<latitude_longitude>_raintable.txt

The file naming convention is defined similarly as shown above with the addition of the following:
yyyymmdd = year, month and day
txt = ASCII data file
minuteRain = one minute rain data
rainRate_gmin = one minute rain rate data
hrlyRain = hourly rain (mm)
raintable = total rainfall measured for a continuous period of precipitation

QC data are in tar gzipped files of the form:

MC3E_Gauge_Data.tgz

where

MC3E = Midlatitude Continental Convective Clouds Experiment
tgz = gzipped Unix "tape archive" format

The following files are contained within the QC tar archive:

MC3E_APU##X_yyyy_RAW0.txt
MC3E_APU##X_yyyy_RAW1.txt
MC3E_APU##X_yyyy.gmin
MC3E_APU##_yyyymmdd_HOURLY.txt
MC3E_APU##_yyyymmdd_HOURLY.png

The file naming convention is as follows:
MC3E = Midlatitude Continental Convective Clouds Experiment
APU = Autonomous Parsivel Unit
## = station identifier
yyyy = year
mmdd = month and day
RAW0 = raw zero and non-zero rain data
RAW1 = raw non-zero rain data
gmin = one minute rain rate data
HOURLY = hourly rain (mm)

png = Portable Network Graphics
txt = ASCII data file

## Data Format

The GPM Ground Validation Met One Rain Gauge Pairs dataset consists of ASCII (.txt) files and plots (.png) containing rain rate data. Within the QC data file MC3E_Gauge_Data.tgz is the document MC3E_Gauge_Data.docx which provides further details on the rain gauge data file formats.

## Citation

Our data sets are provided through the NASA Earth Science Data and Information System (ESDIS) Project and the Global Hydrology Resource Center (GHRC) Distributed Active Archive Center (DAAC). GHRC DAAC is one of NASA's Earth Observing System Data and Information System (EOSDIS) data centers that are part of the ESDIS project. ESDIS data are not copyrighted; however, in the event that you publish our data or results derived by using our data, we request that you include an acknowledgment within the text of the article and a citation on your reference list. Examples for general acknowledgments, data set citation in a reference listing, and crediting online web images and information can be found at: https://ghrc.nsstc.nasa.gov/home/about-ghrc/citing-ghrc-daac-data

## References

Tokay, Ali, Paul G. Bashor, Victoria L. McDowell, 2010: Comparison of Rain Gauge Measurements in the Mid-Atlantic Region. J. Hydrometeor, 11, 553-565. doi: 10.1175/2009JHM1137.1

## Contact Information

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